Velocity Variations in the High-Latitude Solar Wind

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During 1994, the Ulysses spacecraft continuously sam - pled the properties of the solar wind from the south polar coronal hole. At latitudes poleward of - 65° S, there was no longer any systematic variation of the solar wind with longitude [*Phillips et al.,* 1995]. Thus any variations in the plasma parameters were intrinsic to the coronal hole flow rather than being caused by varying distances from the coronal-hole boundary.

Figure 1 shows power spectra of the components of the solar wind velocity obtained poleward of 65"S. At frequencies greater than -2x 10'5 Hz, the principal variations in the velocity were associated with outward propagating Alfvén waves. At longer periods, the variations of the radial component of the velocity exceeded that in the transverse components and the solar wind appeared to be organized into "microstreams" with an amplitude of -40 km/s and a mean width (HWHM) of 0.4 days. The microstreams recurred on time scales of 2-3 days (power spectral peaks at 1.9 and 3,3 days).

A superposed epoch analysis was performed centered on 29 local peaks and on 17 local minima in the radial velocity V_R. The density and temperature profiles showed the expected evidence of pileup and compression during periods of increasing speed. The particle fluxes were nearly the same for both the fast and slow microstreams. The higher-speed microstreams had higher proton temperatures and higher alpha-particle abundances than did the slower ones.

There were no systematic latitudinal variations in the widths of the microstreams or in their recurrence rates, This result suggests that the microstreams are caused by temporal rather than by long lived (> a few days) spatial variations in the solar source region The spectral peaks in Figure 1 coincide with peaks found by *Thomson et al.* [personal communication; 1995] in their analysis of energetic particle and magnetic field data obtained by Ulysses and Voyager. While *Thomson et al. [1995]* suggest that the oscillations are a signature of solar g-mode waves, polar plumes and the supergranulation structure both have approximately the right lifetimes to be possible sources of the microstreams.

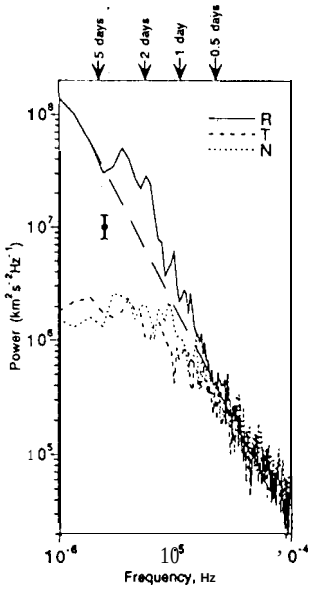

Figure 1. Power spectra of hourly averages of the R, T, and N components of the solar wind velocity observed by Ulysses between Days 153 and 331, 1994.

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References

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